

$$\rightarrow \sin C + \sin D = 2S \quad C$$

$$Q \quad X = \sin\left(\theta + \frac{7\pi}{12}\right) + \sin\left(\theta - \frac{\pi}{12}\right) + \sin\left(\theta + \frac{3\pi}{12}\right)$$

$$Y = \left\{ \sin\left(\theta + \frac{7\pi}{12}\right) + \sin\left(\theta - \frac{\pi}{12}\right) \right\} + \sin\left(\theta + \frac{3\pi}{12}\right)$$

$$\begin{aligned} \sin C + \sin D &\leftarrow X = \left\{ 2\sin\left(\theta + \frac{\pi}{4}\right) \cancel{\sin\left(\frac{\pi}{3}\right)} \right\} + \sin\left(\theta + \frac{\pi}{4}\right) \\ 2(& \end{aligned}$$

$$X = 2\sin\left(\theta + \frac{\pi}{4}\right)$$

$$Y = 2\sin\left(\theta + \frac{\pi}{4}\right) \cancel{\sin\left(\frac{\pi}{3}\right)} + \sin\left(\theta + \frac{\pi}{4}\right)$$

$$Y = 2\sin\left(\theta + \frac{\pi}{4}\right)$$

$$\frac{X}{Y} - \frac{Y}{X} = \frac{2\sin\left(\theta + \frac{\pi}{4}\right)}{2\sin\left(\theta + \frac{\pi}{4}\right)} - \frac{2\sin\left(\theta + \frac{\pi}{4}\right)}{2\sin\left(\theta + \frac{\pi}{4}\right)} = \sin\left(\theta + \frac{\pi}{4}\right) - \frac{1}{\sin\left(\theta + \frac{\pi}{4}\right)}$$

$$\left| \frac{\theta + \frac{7\pi}{12} + \theta - \frac{\pi}{12}}{2} = 2\theta + \frac{6\pi}{12} = \theta + \frac{\pi}{2} \right.$$

$$\left(\text{then } \frac{X}{Y} - \frac{Y}{X} = ? \right) \left| \frac{\left(\theta + \frac{7\pi}{12}\right) - \left(\theta - \frac{\pi}{12}\right)}{2} = \frac{8\pi}{24} \right.$$

$$= \frac{1 + \tan \theta}{1 - \tan \theta} - \frac{1 - \tan \theta}{1 + \tan \theta}$$

$$= \frac{2 \times 2 \tan \theta}{1 - \tan^2 \theta} = 2 \tan 2\theta$$

(Q 2) Series HP

$$Q \cos 6^\circ \cdot \cos 12^\circ \cdot \cos 24^\circ \cdot \cos 48^\circ \rightarrow$$

$$\frac{(2 \cos 6^\circ \cdot \cos 6^\circ) \cos 12^\circ \cdot \cos 24^\circ \cdot \cos 48^\circ}{2 \cos 6^\circ}$$

$$\frac{(2 \times (\cos 12^\circ \cdot \cos 12^\circ) \cdot \cos 24^\circ \cdot \cos 48^\circ)}{2 \times 2 \cos 6^\circ}$$

$$\frac{(2 \cos 24^\circ \cdot \cos 24^\circ \cdot \cos 48^\circ)}{2 \times 4 \cdot \cos 6^\circ}$$

$$\frac{2 \cos 48^\circ \cdot \cos 48^\circ}{2 \times 8 \cos 6^\circ} = \frac{\cos 96^\circ}{16 \cos 6^\circ} = \frac{\cos (90^\circ + 6^\circ)}{16 \cos 6^\circ}$$

$$= \frac{-\sin 6^\circ}{16 \cdot \cos 6^\circ} = -\frac{1}{16} \tan 6^\circ$$

$$\boxed{\frac{\sin (2 \times \text{Largest Angle})}{2^{\text{No. of term}} \times \cos (\text{Smallest angle})}}$$

$$= \frac{\sin (96^\circ)}{2^4 \cos 6^\circ} = \frac{\cos 6^\circ}{16}$$

Q $\sin\left(\frac{\pi}{14}\right) \cdot \sin\left(\frac{3\pi}{14}\right) \cdot \sin\left(\frac{5\pi}{14}\right)$ Nr = Dr half
 $1, 3, 5 \leq 7 \rightarrow \boxed{90-0}$

$\sin\left(\frac{7\pi-6\pi}{14}\right) \cdot \sin\left(\frac{7\pi-4\pi}{14}\right) \cdot \sin\left(\frac{7\pi-2\pi}{14}\right)$ $\frac{7\pi}{14}$

$\sin\left(\frac{\pi}{2} - \frac{3\pi}{7}\right) \cdot \sin\left(\frac{\pi}{2} - \frac{2\pi}{7}\right) \cdot \sin\left(\frac{\pi}{2} - \frac{\pi}{7}\right)$

$\cos\left(\frac{3\pi}{7}\right) \cdot \cos\left(\frac{2\pi}{7}\right) \cdot \cos\left(\frac{\pi}{7}\right)$ $\left(\frac{11}{1}\right)$ hp nahi hai

$\cos\left(\frac{7\pi-4\pi}{7}\right) \cos\left(\frac{2\pi}{7}\right) \cos\left(\frac{\pi}{7}\right)$

$\cos\left(\pi - \frac{4\pi}{7}\right) \cdot \cos\left(\frac{2\pi}{7}\right) \cdot \cos\left(\frac{\pi}{7}\right) = -\cos\frac{4\pi}{7} \cdot \cos\frac{2\pi}{7} \cdot \cos\frac{\pi}{7} = -\frac{\sin\left(\frac{3\pi}{7}\right)}{2^3 \sin\left(\frac{\pi}{7}\right)}$ $\left(\frac{11}{1}\right)$

$$-\frac{\sin\left(\frac{7\pi+\pi}{7}\right)}{8 \sin\left(\frac{\pi}{7}\right)} = -\frac{\sin\left(\pi + \frac{\pi}{7}\right)}{8 \sin\left(\frac{\pi}{7}\right)}$$

$$+ \frac{(+\cancel{\sin\left(\frac{\pi}{7}\right)})}{8 \cancel{\sin\left(\frac{\pi}{7}\right)}} = \frac{1}{8}$$

$$2S C \rightarrow \sin C + \sin C$$

$$Q \ E = \cos^2\left(\frac{\pi}{7}\right) + \cos^2\left(\frac{2\pi}{7}\right) + \cos^2\left(\frac{3\pi}{7}\right) \text{ (sum } E = ?)$$

$$E = \frac{1 + \cos \frac{2\pi}{7}}{2} + \frac{1 + \cos \frac{4\pi}{7}}{2} + \frac{1 + \cos \frac{6\pi}{7}}{2}$$

$$= \frac{3}{2} + \frac{1}{2} \underbrace{\left(\cos \frac{2\pi}{7} + \cos \frac{4\pi}{7} + \cos \frac{6\pi}{7} \right)}_S = \frac{3}{2} + \frac{1}{2} \times -\frac{1}{2} = \frac{5}{4}$$

Trigo DPP 1

Seq $\rightarrow$ DPP 4/5

$$\text{Let } S = \{ \cos 2\theta + \cos 4\theta + \cos 6\theta \} \times 2 \sin \theta$$

$$2S \sin \theta = 2 \sin \theta \cdot \cos 2\theta + 2 \sin \theta \cos 4\theta + 2 \sin \theta \cos 6\theta$$

$$= \sin(\cancel{3\theta}) + \sin(-\theta) + \{ \sin(\cancel{\theta}) + \sin(-3\theta) \} + \{ \sin(7\theta) + \sin(\cancel{5\theta}) \}$$

$$2S \sin \theta = \sin 7\theta - \sin \theta \Rightarrow \sin \cancel{7} \frac{\pi}{7} - \sin \frac{\pi}{7} = 2S \sin \frac{\pi}{7} \Rightarrow 0 - \cancel{\sin \frac{\pi}{7}} = 2S \cancel{\sin \frac{\pi}{7}} \\ S = -\frac{1}{2}$$

DPP 3

$$1) f(x) = 4x^4 - ax^3 + bx^2 - (x+5) \begin{matrix} \nearrow r_1 \\ \rightarrow r_2 \\ \searrow r_3 \\ \quad \searrow r_4 \end{matrix}$$

$$r_1 r_2 r_3 r_4 = \frac{5}{4}$$

$$\frac{r_1}{2} + \frac{r_2}{4} + \frac{r_3}{5} + \frac{r_4}{8} = 1$$

$$\stackrel{\text{Inf}}{=} AM = \frac{\frac{r_1}{2} + \frac{r_2}{4} + \frac{r_3}{5} + \frac{r_4}{8}}{4} = \frac{1}{4}$$

$$\frac{a}{4} = r_1 + r_2 + r_3 + r_4$$

$$GM = \left(\frac{r_1}{2} \times \frac{r_2}{4} \times \frac{r_3}{5} \times \frac{r_4}{8} \right)^{\frac{1}{4}}$$

$$= \left(\frac{5/4}{2 \times 4 \times 5 \times 8} \right)^{\frac{1}{4}} = \left(\frac{1}{64} \right)^{\frac{1}{4}} = \frac{1}{4}$$

$$AM = GM \Rightarrow \boxed{\frac{r_1}{2} = \frac{r_2}{4} = \frac{r_3}{5} = \frac{r_4}{8} = \frac{1}{4}}$$

$$r_1 = \frac{1}{2} \mid r_2 = 1, r_3 = \frac{5}{4}, r_4 = 2$$

Q

$$x^2 + px - \frac{1}{2p^2} = 0 \rightarrow \alpha,$$

$$\alpha^4 + \beta^4 = (\alpha^2 + \beta^2)^2 - 2\alpha^2\beta^2$$

$$= (\alpha + \beta)^2 - 2\alpha\beta)^2 - 2\alpha^2\beta^2$$

$$= \left(p^2 + 2x + \frac{1}{2p^2}\right)^2 - 2\left(\frac{1}{2p^2}\right)^2 =$$

$$\frac{1}{p^4} - \frac{1}{2p^4} =$$

$$\frac{p^4 + \frac{1}{2p^4}}{2} \geq \sqrt{p^4 \cdot \frac{1}{2p^4}} = p^4 + \frac{1}{p^4} + 2 - \frac{1}{2p^4} = \left(p^4 + \frac{1}{2p^4}\right) + 2$$

$$p^4 + \frac{1}{2p^4} \geq \frac{2}{\sqrt{2}}$$

$$\geq \sqrt{2} + 2$$

$$\text{Min} = 2 + \sqrt{2}$$

$$7) 3x + 4y = 5, 16x^2 + 3$$

$$\frac{\frac{3x}{2} + \frac{3x}{2} + \frac{4y}{2} + \frac{4y}{2} + \frac{4y}{2}}{5} \Rightarrow \left(\right)^{\frac{1}{5}}$$

$$5) \frac{x^4 + 2x^2 + 101}{x^2 + 1} = \frac{x^4 + 2x^2 + 1 + 100}{x^2 + 1} = \frac{(x^2 + 1)^2 + 100}{x^2 + 1} = \left[\frac{(x^2 + 1) + \frac{100}{x^2 + 1}}{2} \right] \Rightarrow \sqrt{\cancel{(x^2 + 1)} \times \frac{100}{\cancel{x^2 + 1}}}$$

$$x^2 + 1 + \frac{100}{x^2 + 1} \geq 2 \times 10$$

$$6) \quad a+b+c=24$$

$$\frac{(a+x)+(b+x)+(1-x)}{3} \geq \sqrt[3]{(a+1)(b+1)(1-x)}$$

$$2 \geq (1)(1)(1))^{\frac{1}{3}}$$

$$Q_{10} \quad x^3 - px^2 + qx - 48 = 0$$

$$abc = 48$$

$$\frac{\frac{1}{a} + \frac{2}{b} + \frac{3}{c}}{3} \geq \left(\frac{1}{a} \times \frac{2}{b} \times \frac{3}{c} \right)^{\frac{1}{3}}$$

$$\geq \sqrt[3]{\frac{6}{48}} = \frac{1}{2}$$

$$2 \left(\frac{1}{a} + \frac{2}{b} + \frac{3}{c} \right) \geq 2 \times \frac{1}{2}$$